

One intervention commonly used in Iowa Road Safety Audits is adding a 4' paved shoulder on the side of the roadway, giving motorists a safe place to pull over. Milled rumble strips are also frequently added to the shoulder; jolting drivers awake in case they drift off to sleep while driving.



FHWA

FHWA Feature Program: Road Safety Audits

ELEVATING THE SAFETY OF AMERICA'S ROADS

Each night the evening news reports traffic back-ups, accidents, injuries and deaths that affect the lives of Americans in rural and urban settings. Since no swath of the country is immune to highway safety issues, transportation agencies are riveted on finding solutions to these serious concerns. At the Federal level, an innovative new Federal Highway Administration (FHWA) Road Safety Audit (RSA) Program is one promising initiative to make America's roadways safer, and initial uses in a number of States show the RSA potential to reduce accidents and save lives.

Statistically, most drivers will be involved in a traffic accident during their driving lifetimes and the toll from traffic accidents represents a stark health and economic challenge in the United States. Nearly 43,000 people are killed and more than three million injured in crashes each year. Economic costs have risen to more than \$230 billion annually.

The U.S. Department of Transportation indicates that nearly one-third of automobile accidents could be avoided if poor road conditions, outdated highway geometry, or road hardware were improved. FHWA is charging forward with a myriad of programs to improve roads and bridges nationwide, and RSAs are part of the campaign. The initiative is now featured as a best practice by FHWA's Highways for LIFE because it advances the safety of American roads by addressing a variety of factors surrounding the way they are maintained, designed and built.

What is a Road Safety Audit?

The goal of FHWA's RSA Program is to help produce designs that reduce the number and severity of roadway crashes, reduce construction costs by identifying and correcting safety issues before projects are completed, promote awareness of safe design practices, integrate multi-modal safety concerns and consider human factors in all aspects of highway design. RSAs can be performed on any size project and during any stage of a project, including the planning, preliminary design, detailed design, traffic control, construction planning, pre-opening stages or on existing road segments and intersections.

Through research, FHWA learned the undeniable benefit of RSAs in other countries. The impact of unsafe roads and vehicle crashes is felt globally with an estimated one million people killed in vehicle crashes each year. In response, countries like Great Britain, Australia, New Zealand, and Canada have been successfully performing RSAs since the 1980s to identify opportunities for improvements of new and existing roads.

According to a study by Austroads, the association of Australian and New Zealand road transport and traffic authorities, the benefit/cost ratios realized when recommendations of RSAs were implemented ranged from 3:1 to 242:1. Also, the majority of design audit findings required only very low-cost responses to fix the identified issues, with nearly 65 percent of recommendations made from RSAs costing less than \$1,000. Other benefits included one to three percent reductions in injury costs, fewer crashes, minimized need for remedial work, reduced project life cycle costs and improved awareness of safe design practices.

Clearly, RSAs have a dramatic impact and often at minimal costs to transportation departments. In 1996, the FHWA began studying the possibility of bringing this safety program to the United States. After a careful scan of the impact of RSAs in other countries, FHWA held a workshop in 1998 and initiated a pilot program for one year. During the pilot program, courses to train selected State DOTs and local agencies were developed.

Today, two training courses are available to DOTs or local agencies interested in developing an RSA program. One course conducted by the National Highway Institute charges \$270 per person and is geared towards State DOTs (<http://www.nhi.fhwa.dot.gov/default.asp>). FHWA also offers an RSA course for local agencies and tribal governments (contact louisa.ward@fhwa.dot.gov) and this course is free of charge. In addition to training courses, FHWA has developed a free “Peer-to-Peer” program to help those new to RSAs through their first audit (safetyp2p@fhwa.dot.gov or 866-P2P-FHWA). The “Peer-to-Peer” program matches State or local agencies tackling their first RSA with counterparts from agencies experienced in conducting audits to help guide them through the process.

An RSA Primer: Eight Steps to Success

RSAs have now been conducted in 20 States and local agencies. While each State may conduct RSAs a bit differently or with a different name (Road Safety Assessments, Safety Impact Teams, Road Safety Reviews, etc.), there are eight basic steps that form the core of a strong RSA program. FHWA works closely with States, local agencies, and tribal governments to outline these steps and help them adapt the process to the unique needs of their initiative.

Step One seems relatively straight forward, but in fact requires significant study: identify which projects the department wishes to audit. Important factors to consider include the cost of the project, type of roadway, phase of the project, and the reasons for identifying a candidate project. Some RSAs occur early in the design phase while others occur on completed or existing projects. Other important factors to consider when choosing a project to audit include the cost of the project and the type of roadway. Some Departments even choose to categorize RSAs, such as the Pennsylvania Department of Transportation which divides projects into four categories: capital improvements, 3R projects (resurfacing, restoration and rebuilding projects), safety projects or other projects.

An important Step Two is to build an interdisciplinary team to conduct the RSA. Most teams consist of three to five members with experts in a variety of skill sets including highway/traffic safety, traffic engineering, geometric design, human factors, planning, pedestrian issues, accident reconstruction, enforcement and maintenance. A rock-solid team will have the ability to study the project from all angles to ensure every aspect of safety is considered.

The importance of Step Three, the pre-RSA meeting, cannot be overstated. This is where team members view project information and drawings and define the parameters of the RSA effort. Team members review materials including background information and plans. They also meet with area engineers to have the opportunity to ask questions. Team members often meet with members of the community including local citizens, businesses, and utility companies. The goal is to compile as much relevant information as possible.

Field reviews, Step Four, are performed under various conditions and sometimes with an array of tools such as digital cameras and video cameras to gather information about safety issues at the site. Sometimes, RSA teams use checklists or prompt lists to ensure all aspects of safety have been addressed. Checklist items include road alignment and cross section, pedestrians and bicyclists, lighting, clear zones, human factors, traffic signals, curve radii, public transportation, and barriers, among others. If crash data is available, it can also be another useful input to the RSA team, but is not a necessity. The RSA team looks at everything from whether traffic signals are operating properly to ensuring roadway barriers are installed correctly to making sure bus stops are located in areas where pedestrians can safely cross the street. The goal is to leave no stone unturned.

Once the RSA is conducted, an informal analysis report, Step Five, is prepared and presented to the designers, agency management, or tribal leaders. This informal report outlines findings and gives everyone involved an opportunity to discuss the rationale for issues and constraints faced in making improvements.

After the informal report, the RSA team prepares a written report, Step Six. The written report is a formal document that becomes part of the project's permanent record. All safety issues in the report should be addressed. Once the report is completed it is sent to the design team, agency management, or tribal leaders who are responsible for preparing a formal response.

When the response to the RSA, Step Seven, is prepared, all suggestions made in the RSA report should be addressed. If the RSA team makes a suggestion to improve safety in a certain way, but the design team, agency management, or tribal leaders do not agree with the suggestion or cannot afford to make the change at that time, they should document their reasons in the response report. This documentation is vital in case a crash occurs that could be blamed on that particular safety issue.

Finally, Step Eight is to incorporate findings into projects, when appropriate. It is also recommended that an evaluation program be implemented to track the results of implemented recommendations.

How long does it take to complete an RSA? All prep work for RSA's is done by the project owner, and prep time varies widely depending on how quickly the project owner can gather materials about the project to prepare for the RSA team. Once prep work is complete, the RSA team reviews background information and plans, studies the site, and prepares the informal analysis report; the team usually shares this with the project owners within 2-3 days. The RSA team

then returns home to prepare a written formal report that becomes part of the project's permanent record. This report is usually sent to the project owner in about one week. From start to finish, RSA team members spend 7-10 days completing the actual RSA.

South Carolina: Dramatic Improvements to Safety

The South Carolina Department of Transportation (SCDOT) faced several challenges with making State roadways safer. SCDOT is unique in that it has the fourth largest State-maintained highway system in the Nation. While nationally, only 21 percent of highways are under State control, South Carolina owns and controls 63 percent of its highways.

Vehicle crashes are a serious problem in South Carolina, as elsewhere. Three people, on average, die on South Carolina roadways each day making them the eighth most deadly in the nation. Faced with a budget crisis, a huge highway network to maintain, and lethal safety issues, SCDOT needed to identify efficient and cost effective ways to deal with these problems. To make things more daunting, State highway funding per mile was the lowest in the nation. RSAs seemed a logical step down the pathway to improvement.

SCDOT Director of Safety, Terecia Wilson, had read about the effectiveness of RSAs in reducing accidents in other countries. When she learned FHWA was starting an RSA Program, she was convinced it could help improve South Carolina's roadways. Wilson's first step: meet with engineering directors from all divisions of the department to educate and gather internal support for the program. Looking back Wilson advises, "An early key to the success of the RSAs in South Carolina was garnering commitment to the program from leadership beginning at the top."



Adding a dedicated turn lane on a busy street is another common intervention. Before and after photos from an RSA in Iowa show the difference adding a turn lane can make in preventing head on collisions.

Wilson then worked carefully with her team to define how an RSA program would operate in South Carolina. In addition to the procedural steps, SCDOT invested in a full-time RSA Coordinator to manage the new program for the State. An RSA advisory council was established to provide guidance and direction, and working in tandem with the RSA Coordinator, the council selected which projects would be audited.

Next, SCDOT recruited its audit team: engineers from all departments including highway, pavement, safety, bridge, and environmental experts. More than 60 people have been trained representing experience in all aspects of roadway design in an effort to provide a multi-disciplinary approach for audits.

To date, SCDOT has completed 50 RSAs of existing roads and six RSAs for design projects and the results have been impressive. On Interstate 585 in Spartanburg County, eight recommendations were made and four implemented. The Department saw a 12.5 percent decrease in accidents and a \$40,000 savings. On SC 296 in Spartanburg, 25 of 37 recommendations were implemented leading to a 23.4 percent reduction in accidents with an economic impact savings of \$147,000. On SC 14 in Greenville, all 9 recommendations were implemented with a 150 percent reduction in fatalities and cost savings of \$3.66 million.

Because of budget constraints, typical recommendations made in South Carolina tend to be ones that can be implemented at a low cost, which is one of the strengths of the RSA program. Such recommendations include sight distance improvements such as making sure curves or objects do not obstruct a driver's view of the road, improving pavement markings, improving signing patterns above and beyond what is typically warranted, and planning for future pedestrian accesses even when they are not immediately necessary.

RSAs have made a striking improvement in the safety of South Carolina's roadways and Wilson has two recommendations for other Departments considering the program. First, she believes that strong leadership commitment to the program at the beginning is essential. Wilson says, "Having top level leadership support is critical to the success of the program. With this support, it's easier to encourage staff members to take time to conduct audits; you will also have more success in implementing recommendations."

Next, she recommends hiring a full-time RSA coordinator to manage the process at the State level. Wilson explains, "With a full-time coordinator, one person is responsible for managing the paper trail and following up on recommendations. That way, nothing gets overlooked and excellent documentation is maintained, a legal imperative."

Iowa: A Non-Traditional Approach

While it did not face the same issues as SCDOT, the Iowa Department of Transportation (IDOT) was just as interested in looking for ways to incorporate low cost improvements into its existing roadways. However, when looking at the RSA Program, IDOT felt a different RSA approach would be a better fit. New roads are not as common in Iowa as in other States, and, unlike the steep and curvy roads commonly found in South Carolina, most new roads in Iowa tend to be straight and flat with little opportunity for roadway enhancements.

After careful thought, Iowa saw the RSA program as an opportunity to do safety audits on existing "3R" projects: roadways scheduled for resurfacing. They established training courses to sensitize district engineers and designers about the benefits of low cost safety improvements to pavement resurfacing projects.

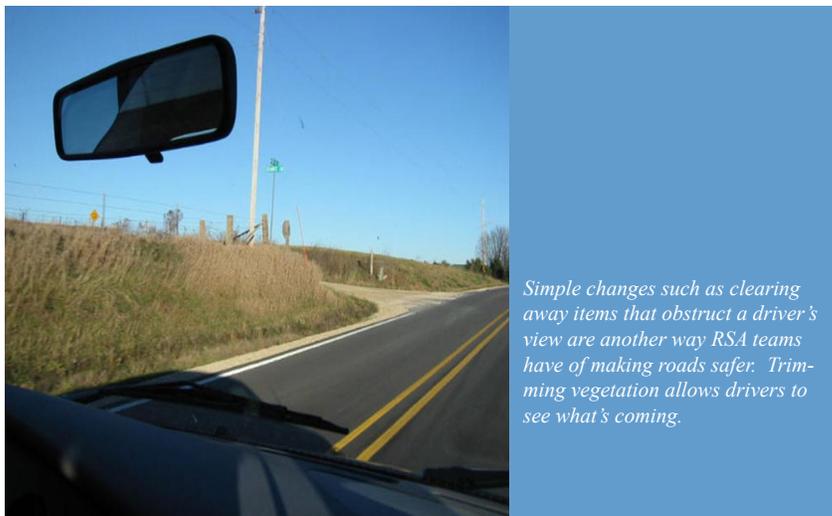
Explains Tom Welch, State Transportation Safety Engineer, “Many engineers have never had a safety design class. We decided to go straight to the people designing resurfacing projects to change their approach. We educated them on the benefits of low cost approaches to improving safety.” Welch adds, “It didn’t take long to get them excited about the idea of making simple adjustments and improvements that would actually save lives.” The enthusiasm was contagious and according to Welch, “Before long, we did not have to tell them what to do to make roads safer. They were coming up with their own plans to improve safety and incorporating those plans into the design phase of projects. On average, five to seven percent of their budget now goes into safety improvements.”

Like South Carolina, the recommendations and improvements made in Iowa’s RSAs have been fairly straightforward and inexpensive. Typical improvements have included adding pavement past the roadway all the way to the shoulder on curves so vehicles do not slip off the edge of the roadway, adding rumble strips to shoulders, extending or adding a grate over culverts to avoid large drop offs, adding safety dikes (escape ramps) opposite all “T” intersections, offsetting left turn lanes, making stop signs larger, and vegetation management to improve site distance.

While Iowa does not have a formal program to track the impact of recommendations, there are two specific cases where recommendations were made with dramatic results. One particular intersection had a curve with a history of terrible crashes. In an effort to make the road safer, bigger and brighter chevrons were put in at the curve. This simple solution produced a 20 percent reduction in crashes.

In another example, a four-lane, undivided highway was repainted to a three-lane roadway. This change went completely against what engineers normally considered optimal, but the result was a 19 percent reduction in crashes. Explains Welch, “Engineers would typically argue that more lanes mean less congestion and less accidents. However, as a result of our audit, we saw that most accidents were occurring when vehicles were stopped in the left lane to turn. Doing something as simple as repainting the roadway and changing it to three lanes reduced crashes and kept traffic moving efficiently.”

IDOT has taken the concept of RSAs and adapted it to meet their unique needs. For Iowa, a State with a small number of new roads scheduled to be built, traditional audits would mean fewer roads would be reviewed. By focusing on resurfacing projects, they have been able to make dramatic safety improvements



on a larger number of roadways and changed the way engineers approach their job. Welch encourages all departments to consider their roadway safety issues, saying “There is a time and place for audits. What may be appropriate in one State may not be appropriate in another. Look at your safety issues and use the concept of the audit program to improve safety on your State’s roadways.”

Liability Concerns: A Solid Paper Trail Helps

While everyone wants to see safer roadways, some have expressed concern that the use of RSAs could increase an agency’s tort liability. RSA proponents say this should not prevent agencies from adopting the model to improve safety on their roadways. According to Louisa Ward, FHWA RSA Program Manager, “A solid paper trail can help alleviate some of this concern. All RSA reports should have a response on file explaining how an agency plans to incorporate findings and why some findings might not be implemented. Also, many courts find favorably for agencies taking a proactive approach to improve safety.”

Conclusion: Sharpen the Focus on Safety

Roadway safety improvements in States that have adopted formal RSA programs have proven significant. Many of the improvements triggered by RSAs have been simple and low cost such as: making a stop sign bigger, repainting road markings, controlling vegetation, adding rumble strips to shoulders and many others. Safety Engineers report that after implementing these basic, low cost improvements, accident statistics in many instances have been notably improved. Finally, keeping the focus on safety in the design process of a project helps engineers and designers make better safety decisions early in the project’s life, providing better and safer designs for America’s roads and bridges.

The RSA process helps an agency maintain a sharp focus on safety; RSAs also represent another successful tool in the highway safety toolbox with a clear potential to save lives.